

# **MARS : RELATION BETWEEN IMPACT SEISMICITY AND RUNOFF FORMATION BY FLUIDIZATION OF PERMAFROST.**

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The survey of 44 networks of channels pointed out 3 main characteristics which distinguish martian channels from terrestrial fluvial features (Cabrol, 1990). Their physiographic parameters show (a) a drainage capacity unconsistant with a meteorological feeding origin (Fig. 1 displays the difference between martian and terrestrial drainage capacity for basins of same area. Over  $3.10^4 \text{ Km}^2$ , martian basins are twice less drained).

This characteristic is correlated with the spatial dispersion over the martian surface which does not show a climatic organization; (b) an amphitheater-like distribution of headwaters centered on the second order junction point. The branch convergence angles are  $40^\circ$  in average; (c) Martian networks display also a high compacity value variation (Gravellius coefficient) from 1.5 to 4 (Earth 1.3).

Experimental models (Kochel, 1982) pointed out surface channel patterns similar to ground water processes of fluidized permafrost or underground water reservoirs. The process of extrusion of permafrost by fluidization (Nummenda, 1983) to a degree up to flow could be supported by our following hypothesis. Vibrations generated by impact seismicity could destructured the permafrost mass. Fig. 2 displays a good correlation between impact flux on Mars and channel apparitions, with a same variation in time, from high density during the early Noachian, to a nearly complete disappearing during the Amazonian period (Carr, 1986; Cabrol, 1990).

During the impact, the cinetic energy is converted into thermal energy (5 to 20%, Melosch, 1985) and mechanical energy. The thermal energy volatilizes the excavated volume of the transient crater as well as the meteorite (O'Keefe, 1985). The mechanical energy is transferred in the megaregolith by two waves : radial and spherical waves. The spherical waves are transferred with a velocity of 4 to 10 Km/sec. according the depth. These waves set in a catastrophic vibration the ice coated particles of the permafrost. The rupture of the internal cohesion triggers the liquefaction with consequent collapse and fluid release. The aquifere retention layers are destabilized when the interstitial pressure is equal to the geostatic pressure of the sublayers. This process is realized if liquid water pockets are maintained inside the cold impermeable layer.

Large-scale outflows as well as small channel networks could derive from the same process - at different scale - of fluidized permafrost failure. As the damping distance of the spheric waves is limited by the degree of impact energy, liquid water pockets may still be present under martian surface.

References :

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